APPENDIX C GENERAL INSTRUMENTATION

3.1 ALTERNATE LIGHT SOURCE

3.1.1 Description

While lasers were first used successfully as monochromatic light sources to induce fluorescence, high intensity lights or alternate light sources with a large concentration of blue or green wavelengths filtered to remove other frequencies have been used to duplicate the controlled illumination and below 540 nm blockage. In many instances, the results of laser detection and xenon arc lamp detection are the same. But fluorescence is determined by light wave frequency and intensity. While some material readily fluoresces with low power illumination, others require greater intensity before fluorescence is induced.

3.1.2 Method

ALS output with peak power at 450 nm and 485.5 nm lines are used most often for impression examination. Both peak lines are blocked by wide band pass filters used in laser goggles and camera filters since they are below the 540 nm cut off. However, when the beam is expanded for evidence examination, the method of beam transmission creates remarkably different effects. Fluorescence either of the impression or background, may be uneven.

Evidence examination procedure for laser/ALS induced fluorescence requires slow, patient movement of the beam over the article. The degree of fluorescence is unpredictable although luminescence from Redwop Powder treatment is generally bright. Evaluation of some weak fluorescence is difficult with filtered visual inspection, and any suspected impression exhibiting signs of light excitation should be photographed.

Photographic proficiency requires sufficient experience based upon trial and error. The combination of varying levels of fluorescence, filtration and beam intensity produces conditions that may require numerous attempts before adequate preservation is obtained.

3.2 GENERAL PROCESSING EQUIPMENT

Latent print/impression examination equipment utilizes an enlarging array of items which include those specifically designed for residue detection and those modified or adapted for the specialized needs of evidence processing. Some equipment and commodities are of such limited availability or of such basic design as to make choice inconsequential.

Manufacturers of films and chemicals adhere to such competitive quality standards that individual preference has no real influence on the results of followed procedures. Materials such as powders, applicators, and lifting devices are far more varied and include items which have no practical value for evidence processing.

Equipment and supplies within the scope of the latent print/impression discipline are the tools of procedures. Such tools are dependent upon the skill and purpose of the examiner using them. Individual preference which has selected an inferior tool used skillfully may have yielded results assessed as satisfactory; better tools applied with equal skill will add to the harvest of productivity.

3.3 POWDERS AND PARTICULATE APPLICATION

3.3.1 Description

Application of dry powders to a nonporous surface is a critical balance of sufficient coloring agent to adhere to the residue without obliterating the development of the impression. This process is commonly called dusting and employs a brush or wand. Heat-generated particulate or suspension-deposited particles need no applicator. Selection of dry powder applicator is based upon the properties of materials used in the construction of the applicator and the damage potential of those materials. Brushes are used for standard powders while ferrous metal powders are normally applied with a magnetic wand.

Properties of all brush construction materials are utilized toward the movement of powder particles with the least possible damage to the impression residue. A brush must deliver powder to the surface and remove excessive particles with extremely light drag and bristle stiffness. Natural bristle brushes composed generally of squirrel hair (labeled camel hair) are, in initial condition, very soft and pliable. Feather brushes offer naturally delicate applicators at the tips of the barbs and the usual presence of some down. Fiberglass brushes use collections of very fine glass strands while carbon filament brushes are composed of almost pure carbon strands. Magnetic wands are constructed of a permanent magnet attached to a movable rod inside an aluminum housing. The tip of the housing is very thin to permit magnetic attraction when the rod is depressed but thick enough to block attraction when the magnet is raised.

3.3.2 Method

Initial characteristics of brush material is often negated upon use. Contact with the surface processed brings contamination. Natural materials, animal hair and feathers, will absorb contaminants readily. Cleaning is difficult and seldom returns the brush to initial condition. Continued use causes bristles or barbs to bind together and lose pliancy. Once this process begins, the evidence damage potential increases immediately to an unacceptable level.

Synthetic materials tend to resist surface contamination, and because foreign material is not absorbed, can be satisfactorily cleaned with mild detergent and water. Continued use creates a splintering effect to individual bristles, forming strands of softer and lighter contact.

Carbon filament splinters tend to snap off, while fiberglass splinters tend to remain affixed to the main strand.

3.3.3 Results

For nearly all routine, nonporous surface powder applications, fiberglass brushes are superior. Carbon filament brushes perform quite well but do not improve in desired qualities to the extent of fiberglass. Squirrel hair brushes must be monitored carefully and discarded at the first sign of bristle contamination. Feather brushes are impractical and have no real value since the development of the fiberglass brush. All magnetic wands are essentially the same, provided attraction is present and the magnet remains movable.

3.4 POWDERS

3.4.1 Description

For powders to be effective they must adhere to trace amounts of impression residue that contain a wide array of moisture content and viscosity. In addition, they must possess selective adhesion so that particles will not stick to a variety of potential substrates. No one ingredient can offer such desired qualities, therefore, powders are mixtures of various substances in specific proportions resulting in combined properties of moisture adhesion with dry surface release.

Years ago, commercial products were manufactured with a disregard for wide-range application and batch consistency. Dedicated examiners resorted to self-prepared mixtures, arriving at proportions by trial and error and personal preference, with arduous grinding and sieving to achieve small, uniform particle size. The result was a plethora of formulae with no consensus on any specific mixture for any given task. The consequence was an assumption that lack of development meant no impression residue present when, in fact, lack of development was due to poor adhesion of the materials used. This was particularly valid when the color of the ingredients was a priority over the adhesion characteristics.

Today, nearly all commercial latent print developing powders are the product of careful experimentation and rigid quality control. While some powders are still designed with higher regard to color contrast for photographic purposes than ability to adhere, most experienced examiners restrict powder usage to black and gray. Rainbow palette powders may facilitate subsequent photography but may fail to properly reveal all detail. Black and gray powders function better and generally provide ample contrast for adequate photographic preservation.

Nearly all black and gray powders available from established suppliers are effective. Tests conducted by examiners within the Command revealed Lightning Black Powder was superior to other brands as a standard, general purpose powder.

Magnetic powders are mixtures of ingredients with a high percentage of extremely fine iron filings.

Nearly all manufacturers of fingerprint supplies offer magnetic powder. Black, silver, and grays are available. Magnetic powder has a larger particle size by design but the coarse nature of the powder seldom interferes with adhesion due to the extremely light force exerted during application.

Bichromatic powders have been developed which offer photographic contrast regardless of substrate color. These powders are formulated with two main ingredients which produce a dark gray appearance. On light backgrounds, the powders appear almost black, but on dark surfaces have a silver-toned sheen. Tests have shown that most such bichromatic powders have less adhesion than good quality black or gray powders, and that convenience is obtained at the sacrifice of quality.

3.4.2 Method

Standard latent print/impression development powders are most effective on relatively smooth, nonporous surfaces which are dry except for the residue deposit. Textured surfaces or those possessing an inherent coating or film cause excessive, nonselective adhesion, a condition referred to as "painting." Magnetic powders may be used on most nonporous surfaces, but are particularly effective on textured items and certain plastics which tend to resist moisture adherence, such as sandwich and garbage bags. Magnetic powder has been used successfully on phonograph recordings and other ribbed surfaces, due primarily to the coarse particle size and the relative ease of excessive powder removal. However, on surfaces with a coating or film, magnetic powder exhibits a greater tendency to "paint" than standard powders.

Color selection is determined by the tone of the substrate. Except for very dark, dull backgrounds, black powder can be used successfully for photographic preservation as well as lifting. Due to the adhesion superiority of black powders, they should be used when sufficient contrast to background permits.

Powders are formulated to resist moisture absorption from humidity. Containers should be kept sealed between times of usage and the closed jar should be shaken vigorously prior to opening. Lumps which fail to disintegrate from shaking should be discarded. Powders which begin to cake indicate excessive moisture absorption and should be treated or discarded. Caked powders can be dried by spreading the contents on a piece of cardboard and placing in a low-temperature oven or a microwave oven at a lower power. Powders can be stored in desiccators to reduce the amount of moisture the powders are exposed to and limit the amount of clumping.

Many examiners prefer to apply powders from a secondary supply area rather than directly from the powder container. A small amount of powder is poured onto a disposable surface such as a piece of paper or a weigh boat, which then serves as the source for all contact between the brush and powder. Any remaining powder on the supply surface is discarded when processing is completed. The effectiveness of this secondary supply procedure is dependent upon the type of brush used and the nature of the surface for processing.

Even small amounts of grease or oil introduced to the powder supply can create particle bonds ranging from minute clumps to very noticeable chunks. Unlike moisture-formed bonds, these collections of particles cannot be easily separated and pose a high damage potential. Their acquired tackiness causes easy adhesion to bristle contact but prevents proper dislodging. As a result, they act as a vehicle for residue removal.

Fiberglass brushes reduce the risk of powder supply contamination but with surfaces displaying a coating suspected to be of a greasy or oily nature, the use of a secondary supply is highly recommended.

Magnetic powders are packaged in smaller containers than standard powders. They are consumed very slowly in application, since excess recovery is easily accomplished with the magnetic wand. With no actual bristle contact involved, contamination of magnetic powder seldom occurs.

3.4.3 Safety Factors

Any use of latent powders produces airborne particles which represent a certain degree of health risk. The effectiveness of powders to reveal impression residue has prompted a competition among manufacturers which, in some cases, increased toxicity of some products with no apparent benefit in performance. The presence of lead in white powders a number of years ago created major concern and ultimately the element was removed. Unfortunately, no adequate substitute has been discovered, and white powder is no longer recommended for processing.

Proper ventilation for the use of fingerprint powders in the laboratory can greatly reduce the quantity of airborne particles and possible inhalation. Fume hoods generally create excessive air movement and make application of powders to the item very difficult. Box-type systems which mount on the wall, similar to devices used by welders, may be effective provided motors and fans move sufficient amounts of air to pull airborne particles away from the examiner. Filter masks or respirators which can filter airborne particles can be used. Disposable masks are acceptable. Respirators with replaceable filter canisters are also effective. Care should be taken to ensure the filters chosen will be able to filter the correct particle size.

Restriction of powder selection to avoid those with known toxic substances is also recommended.

One powder, Sirchie "Hi Fi Volcano Black" was found to contain both fluoranthene and pyrene, polynuclear aromatic hydrocarbons known to be carcinogens. This powder should be discarded. Others, such as bronze, silver, or safecracker, have metallic bases of high health risk and no demonstrated advantage. Dragon's blood and lycopodium-based powders are organic and complicate detailed knowledge of the nature of their composition. Twelve powders have been analyzed spectrographically and contain elements with a varying degree of risk.

This information, along with the toxic effect and OSHA Occupational Exposure Limits, is listed below:

1. Sirchie "Silk Black": Aluminum, Calcium, Magnesium, Manganese, Silicon, Sodium, Titanium, Zinc.

2. Sirchie Magnetic Black: Aluminum, Iron, Magnesium, Titanium.

3. Sirchie Gray: Aluminum, Calcium, Magnesium, Silicon, Sodium, Titanium.

4. Sirchie White: Aluminum, Calcium, Iron, Magnesium, Silicon, Titanium.

5. Sirchie Magnetic Silver: Aluminum, Calcium, Iron, Magnesium, Manganese, Titanium.

6. Ace Black: Aluminum, Calcium, Magnesium, Silicon.

7. Ace Gray: Aluminum, Calcium, Iron, Lead, Magnesium, Manganese, Silicon.

8. Criminalistics Research Products (CRP) Magnetic Black: Aluminum, Iron, Magnesium, Titanium.

9. CRP Magnetic White: Aluminum, Calcium, Iron, Magnesium, Manganese, Titanium.

10. CRP White: Actinium, Aluminum, Calcium, Iron, Magnesium, Silicon.

11. Magna Gray: Iron, Magnesium, Manganese, Nickel.

12. Magna Silver: Aluminum, Calcium, Iron, Magnesium, Manganese.

Substance	Toxic Effects	Exposure Limits
Actinium	Radioactive	As for all radioactive materials
Aluminum	Neoplastic	TCLo: 257 mg per m^3 in 60 days
Calcium	_____	TWA: 5 mg per m^3
Iron	Carcinogenic	TWA: 10 mg per m^3
Lead	Central Nervous System	200 micrograms per m^3
Magnesium	_____	TWA: 15 mg per m^3
Manganese	Central Nervous System	Cl : 5 mg per m^3
		TCLo: 11 mg per m^3
Nickel	Carcinogenic	TWA: 1 mg per m^3
Silicon	_____	_____
Sodium	_____	_____
Titanium	_____	TWA: 15 mg per m^3

TCLo = Lowest published toxic concentration
TWA = Time weighed average
Cl = Ceiling concentration (maximum allowable exposure)

Aluminum, present in many commercial preparations, is currently being researched for a possible connection to Alzheimer's disease. Any correlation between exposure and the onset of the disease may adjust levels from those listed as toxic concentrations.

Traditionally, fingerprint powders have been used with little regard for safety. Powders applied in a laboratory environment require appropriate safety standards. Ventilation systems, filter masks, or respirators and immediate cleaning of contaminated skin and clothing are essential.

3.5 LIFTING MATERIAL

3.5.1 Description

Powder and particulate-developed impressions should be preserved. Photographic preservation is the first and most important method, and once accomplished, may serve as the only preservation technique. Impression residue visualized by powders or particulate is more fragile and susceptible to damage than undeveloped deposits. Accidental contact with any other surface, even packaging, may obliterate or completely remove the developed impression. A second form of preservation exists which preserves the actual evidence, the use of lifting material.

Lifting materials provide a means of capturing the particles adhering to the developed impression, either to effect a transfer preservation or to protect the visualized impression on the surface. Such lifting material is manufactured with an even coating of adhesive to provide specific degrees of tack or utilizes substances which possess an inherent adhesive quality.

Transparent lifting material is more widely used and is available in many variations of the same basic principle: a clear, thin film with an even coating of adhesive designed to be free of defects. The simplest and most effective form is pressure wound tape produced in rolls and available in widths ranging from one to four inches. One and one-half or two-inch wide tapes are most popular and will provide satisfactory lifting capability for most impressions. The acetate film of lifting tapes can be either clear and glossy or frosted. Regardless of type, lifting tapes generally provide versatile and effective means to transfer powder or particulate-developed impressions to another surface specifically selected for the purpose of preservation.

3.5.2 Method

After photographic preservation, transparent lifting materials are generally used in routine lift preservation, while opaque lifting materials are restricted to developed impressions on curved surfaces or visible impressions created by the touching of a dusty surface.

Transparent materials preserve impressions in the correct position of contact, while opaque lifters produce a position reversed image. Such position reversal complicates a comparison to inked impression which most often requires a photographic intermediate procedure to return to true position. However, the high degree of flexibility inherent in the rubber material of opaque lifters permit successful transfer from irregular-shaped surfaces such as light bulbs and other round objects when acetate films will fail.

Opaque lifters are used by cutting out a section slightly larger than the area of the developed impression from the available sheet. The protective cover is removed and the exposed rubber section is placed gently but firmly onto the surface bearing the impressions. On round items, initial contact between the lifter and the surface is made at the approximate center of the impression, then the rubber material is gently shaped toward the edges.

This is a difficult procedure which requires considerable practice to obtain uniform contact without lifter slippage and should only be attempted if photographic preservation is complete and secondary preservation is essential. On curved surfaces, the lifter can be rolled from one side of the impression to the other in one slow, continuous motion. Once the lift is accomplished, the plastic cover is replaced over the lifter.

Transparent lifting tapes are used in the same manner regardless of the type of tape selected. Frosted tape is more flexible than clear and will retain ink or pencil markings. The glossy surface of clear tape produces considerable glare reflection which can present some inconvenience during examinations or subsequent photographic preservation. The adhesive qualities of frosted tape are sufficient to remove the particles of a developed impression but have less of a tendency to attract loose or flaking substrate material. The main advantage, however, is a property of the acetate which serves as an indicator of complete surface contact. The natural appearance of the tape is translucent. When placed on a surface and pressed with the fingertip or rubbed with the thumbnail, the areas of thorough contact become transparent. When all portions of the developed impression can be observed distinctly, the examiner is assured of total powder or particulate adhesion. Since a major cause of inadequate lifts is incomplete contact between tape adhesive and particles imbedded in surface irregularities, this indicator property is extremely beneficial.

With minimum practice, lifting tapes can be easily and effectively used. A small section of the tape end is folded over onto itself, adhesive to adhesive, to form a tab. The tape is then unrolled to a length slightly longer than the area to be lifted. The tape is placed on the item surface at a spot adjacent to the impression and then the fingertip is run down the center of the tape toward the tab end. From this center anchor, the tape is rubbed toward the edges until the entire section of tape has thorough contact. The tape is removed by pulling the tab slowly from the item. Once disengaged from the item surface, the tape is placed on an appropriate backing in the same manner.

Larger impressions may require wider tape or the use of overlapping strips. Several sections of tape may be applied with each section placed to create a slight overlap of the one next to it. When the impression is completely covered, the overlapped sections can be removed as one by grasping all tapes simultaneously. With care, the entire impression will be preserved with no missing areas.

Two-layer devices are seldom used in laboratory examinations, although they have a certain degree of popularity with some crime scene investigators. Designed for simplicity in operation and the convenience of a lifter and backing unit, they generally yield less productive results than tapes or opaque lifters. Two general types are available, those with solid backing material and those with transparent backings. Because all are precut, a variety of sizes are available and are usually required in routine processing occasions. The end result is a collection of lifted impressions of no uniform dimensions, some quite small and easily lost. Those in which the lifter portion is improperly repositioned to the backing present exposed adhesive which can stick to other lifters or to containers.

Solid back lifters reveal the impression in true position. However, transparent lifters require a marking to denote the positive side. Transparent lifts can be photographically preserved using back lighting, either from a light box or an enlarger.

Two-layer units are used to lift impressions in the same manner as tapes except one edge is prepared to serve as a tab. The acetate film is usually less flexible than tapes and, therefore, if used are restricted to flat surfaces or those with slight, regular curvature.

Use of any lifting material during low humidity conditions is sometimes hampered by a static electricity build-up on the acetate covers or tapes. This charge can create an attraction between lifting material and surface which may make control of the material prior to positioning over the developed impression very difficult. Contact of the non-adhesive side of the lifting material with a conductive metal immediately before positioning will dissipate the static charge.

3.5.3 Results

Lifting materials, especially tapes and opaque lifters, provide an excellent means of evidence preservation. Generally, this is secondary to photographic preservation. However, on occasion, the experienced examiner may elect to use lifting as the primary form of preserving powder or particulate-developed impressions due to practical considerations concerning type of evidence, quantity of items, and time involved in photography. Such decisions must be based upon the confidence of the examiner that lifting will produce the desired results of proper and effective preservation. Any deviation from the procedure of photographic preservation followed by lifting must be based upon sound and prudent reasoning. Any destruction of evidence by the lifting method without prior photography must be considered improper and inadequate procedure.

3.6 BACKING MATERIAL

3.6.1 Description

Single layer transparent lifting materials used to remove a developed impression from the surface of deposit must be affixed to another surface for preservation. The type of preservation surface, commonly called backing material or lift cards, greatly affects the final condition and appearance of the completed lift. Generally, only two colors of backing material are required, white for dark powder-developed impressions and black for light powders. However, those examiners restricting powder usage to black and gray will need only white backing material.

While any white material may be used as a lift backing for some occasions, specific surface properties of the backing can add desired clarity and contrast. Absence of noticeable fibers or other defects, uniformity in color and high surface gloss will greatly aid in the observation of characteristics and facilitate evaluations and comparisons. Two such materials provide the best backing surface properties: photographic paper and commercially prepared backings.

Commercial lift cards provide the most desired characteristics of a lift backing. Available in both white and black, the backing surface is an opaque coating of resinous material that possess high gloss, flexibility and strength. Manufactured with superb quality control, these lift cards provide a background surface that offers the ultimate contrast to the developed powder or particulate impression.

3.6.2 Results

Properly developed and lifted impressions placed on appropriate backing material can provide excellent conditions for impression evaluation and comparison. The use of recommended backing materials will produce the required contrast, clarity, and permanence for subsequent examination procedures.

3.7 MAGNIFIERS

3.7.1 Description

Optical fingerprint magnifiers provide between 4 and 5 power enlargement of impressions with 4.5X the most commonly available instrument. Generally, the optics consist of several elements, often coated, to magnify the viewed object with a minimum of distortion. Field of view is usually sufficient to observe characteristic relationships without repositioning the magnifier.

3.7.2 Method

Horseshoe base magnifiers are equipped with a screw adjustment to permit proper object-to-lens distance for the examiner's particular vision. An optional lock ring will hold the settings during the extensive handling of the magnifier. Column type magnifiers are adjusted up or down the pedestal until correct focus is obtained and held in position by a set screw.

Utilizing a good light source, the examiner can readily evaluate most impressions with the 4.5x magnification. For comparisons, some examiners prefer two magnifiers, one placed over the area of interest and the other positioned over the comparable area of the known impression. This normally requires shifting the head back and forth to view each area. Needle-type pointers are essential to maintain a reliable reference of friction ridge characteristics. While this method can be quite effective for those individuals trained to compare two separate fields of view, many examiners prefer a single magnifier approach in which the questioned impression and the known impression are placed side by side. A simple fold of the impression lift or photograph will permit comparable area positioning. This method forms a split image beneath the magnifier which facilitates characteristic comparison by eliminating alternate field inspections.

3.7.3 Results

High quality magnifiers are an effective tool for marginal impression evaluations and comparisons. While occasionally photographic enlargements or image enhancement may be required to reach conclusions of impression suitability or identity, the use of standard fingerprint magnifiers will produce satisfactory results in routine examination procedures.

3.8 SPECIALIZED PROCESSING EQUIPMENT

In addition to basic equipment needs related to routine evidence processing, certain specialized apparatus can facilitate portions of various techniques, improve the consistency of results or enable examinations to a greater depth of analysis. Some are employed so infrequently that they cannot be defined as mandatory pieces of equipment while others have adequate, if more complicated, procedural alternatives. No one listing can supply a complete catalog of specialized equipment which may have some application to evidence processing on some occasion.

3.9 HEAT/HUMIDITY CHAMBERS

3.9.1 Description

Environmental chambers or cabinets which permit adjustment of temperature and relative humidity are required to assure the maximum potential from selected processing procedures. Optimum heat and humidity levels can be maintained for post treatment development during ninhydrin processing and pretreatment of items to be processed with amido black.

Environmental chambers are available in various sizes, qualities, and prices. Basic design consists of an insulated cabinet containing heating and cooling elements combined with humidifying/dehumidifying devices. Cost is related to construction quality and tolerances of temperature/ humidity settings. Impression processing benefits from environmental control occur within a relatively broad range of temperatures and humidity fluctuations so that precise maintenance levels are not critical. Changes of $\pm$ 10^{O}F or $\pm$ 5% RH do not appear to affect the reliability of reactions except in terms of time requirements.

Adequate storage space and construction quality are important factors. Unreliable components and excessive condensation may present conditions in which evidence is damaged by the chamber. Unfortunately, large volume and component integrity are associated with high cost.

3.9.2 Method

The need for humidity to produce effective ninhydrin-amino acids chemical reaction must be balanced with the solubility of the amino acids in water. Heat/humidity chambers should function at 70% RH in a temperature range from ambient to 80^{O}C. Higher temperature operation should not produce condensation which can diffuse amino acids. Dry, processed articles are placed in the prepared chamber. Slightly better results are obtained from exposing the items to a temperature of ambient or a little above with a relative humidity of 70%. An acceptable alternative is exposure to a temperature of 50^{O} to 80^{O}C at 70% relative humidity for five minutes.

3.9.3 Results

Heat and humidity at the prescribed ranges will produce uniformly consistent ninhydrin-amino acids chemical reactions with minimal residue diffusion and background discoloration. Developed suitable impressions require photographic preservation.

3.10 SPECIALIZED LIGHT SOURCES

3.10.1 Description

Routine examination and photographic requirements usually can be accomplished with the aid of incandescent lamps, such as photo flood lights, or quartz lamps especially designed for camera illumination. These sources provide white light saturation ample for most tasks although they generate heat which may be detrimental to some types of sensitive evidence. Other light sources may provide facility and convenience for particular articles of evidence or may yield additional or superior evidence when applied toward photographic preservation. These include fluorescent light boxes, fiber optics illuminators, ultraviolet, fluorescent light sources and infrared viewing systems. In addition, lasers and alternate light sources may be utilized as a light source without regard toward actual evidence examination.

3.10.2 Method

<u>Fluorescent light boxes</u> with frosted glass or plastic diffusers provide an excellent back lighting source. Transparent or translucent items placed on the light box may reveal better detail and permit easier and more complete photographic recording than with reflected light. Light boxes are also beneficial in the evaluation of negatives and the preparation of photographic enlargements for courtroom displays.

Fiber optic illuminators provide a highly controlled, maneuverable light source which can easily be positioned to provide directed illumination with irregularly-shaped surfaces. Impressions located in recesses, may be successfully illuminated when conventional lighting techniques would create masking shadows. Most fiber optic illuminators have irises which permit control of light intensity and have heat absorbing filters which permit illumination of sensitive materials. A fiber optics beam directed into the edge of some plastics produces an effect similar to fluorescence with latent print residue.

Fluorescent illuminators, such as those that are used in microscopic examinations, provide for a softer more diffuse light source. This type of light has been found to be very beneficial when photographing highly reflective surfaces such as chrome, plastics or metal plated objects.

Ultraviolet and infrared viewing systems may be useful in reducing the interference of certain inks used in cancellation stamps on checks. Ultraviolet illumination may be utilized to create background fluorescence on surfaces such as cardboard or cloth to enhance chemically-developed impressions.

Alternate light sources have vastly improved over the years and the intensity that can be delivered by these sources has also improved. Lasers are still superior in the amount of watts that can be delivered to illuminate a surface for fluorescent examinations. However, the advent of continuously tunable filtration in alternate light source systems shows great potential. This allows the examiner to fine tune the wavelength of light so that the impression fluoresces while any background fluorescence is minimized. This can improve the contrast with impressions that may show a weak fluorescence, and may be obliterated by background fluorescence, such as with some zinc chloride developed impressions. This ability to continuously fine tune the filtration provides an aspect not available with lasers.

Additionally these alternate light sources can be used multi-wavelength fiber optic illuminator. Using the alternate light sources in this fashion is beneficial in that some substrate or residues may show more contrast using specifically filtered wavelengths of light as opposed to the broader spectrum of a basic fiber optic illuminator. This may provide a contrast that makes the photographic preservation more simple or may produce a contrast that could not be achieved by other means.

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